PEER REVIEW RESPONSE DOCUMENT

ADDRESSING THE PEER REVIEW

RECEIVED ON:

REGULATORY IMPACT ASSESSMENT FOR PROPOSED HAZARDOUS WASTE COMBUSTION MACT STANDARDS, DRAFT
November 13, 1995

Economics, Methods, and Risk Analysis Division
Office of Solid Waste
U.S. Environmental Protection Agency

July 1999

Final For Docket

ACKNOWLEDGMENTS

The Agency recognizes Industrial Economics, Incorporated (IEc.), for the overall organization and development of this report. Lyn D. Luben, Gary L. Ballard, and Barnes Johnson, all of the U.S. Environmental Protection Agency, Office of Solid Waste, provided guidance and review.

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INTRODUCTION

Background

In May 1993, the U.S. Environmental Protection Agency (EPA) introduced a draft Waste Minimization and Combustion Strategy designed to reduce reliance on the combustion of hazardous waste and encourage reduced generation of these wastes. Among the key objectives of the strategy is the reduction of the health and ecological risks posed by the combustion of hazardous waste. As part of this strategy, EPA is developing more stringent performance-based emissions standards based on the "maximum achievable control technology" (MACT) approach. The final MACT standards are being promulgated by EPA under authority of the Clean Air Act, as amended (CAA). Three categories of hazardous waste combustion facilities are subject to these revised standards:

- Hazardous waste incinerators, both commercial and on-site;
- Hazardous waste-burning cement kilns; and
- Hazardous waste-burning lightweight aggregate kilns.

EPA proposed MACT standards for these combustion sources on April 19, 1996 (61 FR 17358). Because the proposed rule was expected to result in total national costs greater than $100 million annually, the proposal represented a significant regulatory action, requiring compliance with Executive Order 12866. A Regulatory Impact Assessment (RIA) was prepared in accordance with this order. This RIA analyzed the costs and benefits, as well as economic and distributional impacts of the rule.

A panel of three independent experts reviewed the RIA, focusing on the following analytic areas:

- Marginal Cost Framework;
- Breakeven Analysis;
- Imputation of Revenue Streams;
- Waste Minimization Alternatives;
- Profitability; and
- Property Value Analysis.

The panel was also encouraged to comment on any other aspects of the RIA that could be improved. A report containing the panel's comments (June 1996) is available at the EPA RCRA docket and is also included as an appendix to this report.

Purpose and Organization of Document

This "Response to Comments" document contains our responses to the major issues raised by the Economics Peer Review Panel. We also explain how we adjusted our data and/or analyses to address certain issues raised by the peer review panel. These improved methodologies and assumptions were used in the economic assessment of the final standards. A complete copy of the final economic assessment entitled: *Assessment of the Potential Costs, Benefits, & Other Impacts of the Hazardous Waste Combustion MACT Standards: Final Rule*, is available in the EPA RCRA docket. Throughout our comment responses in this document, we refer to the 1995 analysis prepared at Proposal as the "RIA," and to the revised 1999 document prepared in support of the Final Rule as the "*Assessment*."

This document is organized into two main sections. In the first section, we present a summary of the key issues raised by the economics peer review panel, along with our responses. We identified six key areas of concern raised by the peer review panel: (1) document organization and objectives; (2) social cost analysis; (3) benefits analysis; (4) segmentation of wastes and combustion markets; (5) data inputs; and (6) waste minimization analysis. In the second section, we provide more detailed responses to specific comments, organized in the same structure as the Economics Peer Review Comments. The following topics are addressed:

- General Comments
  - -- Aims, objectives and organizing principles for the RIA
  - -- Social costs versus compliance costs
  - -- Benefits analysis
- Chapter-By-Chapter Comments
  - -- Requirements of Executive Order 12866
  - -- Regulatory requirements encouraging combustion
  - -- Combustion market structure
  - -- Compliance costs versus social welfare costs
  - -- Costs versus economic impacts
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  - -- Baseline cost analysis
  - -- Waste minimization analysis
  - -- Breakeven quantity (BEQ) analysis
  - -- Revenue and pricing increases

-- Operating profits
-- Analysis of total costs
-- Benefits analysis

SUMMARY OF MAJOR ISSUES AND RESPONSES

This section summarizes our responses to the major issues contained in the Peer Review Economics Panel comments. The Panel's comments are summarized and categorized into six issue areas: (1) document organization and objectives; (2) social cost analysis; (3) benefits analysis; (4) segmentation of wastes and combustion markets; (5) data inputs; and (6) waste minimization analysis.

Document Organization and Objectives

Clarify the aims, objectives and organizing principles for the RIA. The Peer Reviewers stated that while the 1995 RIA generally meets the requirements set forth by OMB's Guidance regarding the economic analysis of federal regulations under Executive Order 12866, they argued that the RIA would be substantially improved if it conformed with OMB's Guidance, especially with regard to organization and clearly stating the objectives of the document.

> In the 1999 *Assessment*, we restructured the document so that it is more in line with OMB's 1996 Guidance for conducting Economic Analysis of Federal Regulations Under Executive Order 12866. The 1999 *Assessment* includes the following elements in the first chapter which address concerns of the reviewers: the objectives of the Economic Assessment, the analytical requirements the document fulfills, the rationale for regulatory action, an examination of alternative regulatory options, the anticipated effect of the MACT standards, and our analytic approach and organization for the subsequent chapters.

Social Cost Analysis

Distinguish compliance costs from social costs; use the welfare economics definition of social costs. The Peer Review panel also emphasized that the compliance costs need to be clearly distinguished from social costs, as defined by the theory of applied welfare economics.

> In the 1999 *Assessment*, we clarify the difference between compliance costs and social costs, and explain how the rule will likely affect producers and consumers. We explicitly lay out the economic framework for the social cost analysis in Chapter 5, "Social Cost and Economic Impact Analysis," in the section titled "Social Cost Methodological Framework." Social costs are presented distinct from compliance cost estimates, which we include in Chapter 4 "Compliance Cost Analysis."

The *Assessment* uses a simplified partial equilibrium analysis to estimate social costs. In a partial equilibrium analysis, changes in economic welfare are measured by summing the changes in consumer and in producer surplus. Economists typically estimate these changes by using econometric techniques to estimate the supply and demand curves, and then assess shifts in these curves. Because hazardous waste combustion markets have changed rapidly over the last several years, using historical data to construct these curves does not provide an accurate picture of the current combustion market. In addition, the hazardous waste combustion market is somewhat segmented, with different sectors providing different types of combustion services. Data are not adequate to support econometric analysis at this level of complexity.

As an alternative to an econometric model, we have developed a simplified approach designed to bracket the welfare loss attributable to the MACT standards. This approach bounds potential economic welfare losses associated with the rule by considering two scenarios: (1) compliance costs assuming no market adjustments (the upper bound), and (2) market adjusted compliance costs (the lower bound).

Benefits Analysis

Provide a more complete and rigorous benefits analysis. Reviewers noted that the benefits analysis was weak and not responsive to the requirements of Executive Order 12866.

In the 1999 *Assessment,* we use results from an extensive multi-pathway risk assessment to develop human health and ecological benefit estimates[1]. For the human health analysis, we estimate benefits from cancer and non-cancer risk reductions. We monetize cancer risk reduction estimates by applying the value of a statistical life (VSL) to the risk reduction expected to result from the MACT standards. We assign monetary values to non-cancer benefits using a direct-cost approach which focuses on the expenditures averted by decreasing the occurrence of an illness or other health effect.

We also include an ecological benefits analysis in the 1999 *Assessment.* In this analysis, we calculate land and water areas that may experience reductions in ecological risk criteria below levels of concern. Reductions of dioxin, mercury, and lead were found to provide some potential for improvement of terrestrial and aquatic ecosystems. In the *Assessment,* we do not assign monetary values to these potential ecological benefits because no methodology exists to link an exceedance in the

[1] *Human Health and Ecological Risk Assessment Support to the Development of Technical Standards for Emissions from Combustion Units Burning Hazardous Wastes: Background Document - Final Report*, July 1999.

ecological risk criteria with a concrete benefit measure, such as increased fish populations, for which a benefits transfer approach could assign monetary values.

Segmentation of Wastes and Combustion Markets

Model waste markets to reflect segmentation across waste types. Waste streams that are easier to burn command lower prices, which should be reflected in the economic modeling. Also, if certain combustion sectors can only handle the more easy-to-burn waste types, then their baseline costs should also reflect this situation.

Instead of using different combustion prices for kilns and incinerators, the pricing approach used in the 1999 *Assessment* assigns different prices to different types of wastes. Waste management prices depend on several factors. These include the waste form (solid/liquid/sludge), heat content, method of delivery (e.g., bulk versus drum), and contamination level (e.g., metals or chlorine content). In addition, regulatory constraints (e.g., prohibitions against burning certain types of wastes) and technical constraints (e.g., adverse effects of certain waste streams on cement product quality) also influence combustion prices. Although data limitations prevent us from accounting for all factors, the information on heat content and constituent concentrations from EPA's National Hazardous Waste Constituent Survey (NHWCS) allows us to improve the characterization of combusted waste. The result from our data analysis of the NHWCS, along with discussions with industry representatives, is seven categories of waste types to which we assign prices.

For the 1999 *Assessment*, baseline costs have also been adjusted to reflect differences in the performance and capabilities across combustion systems.

Data Inputs

Update data inputs to reflect most recent information. The reviewers criticized the use of old data for the analysis.

The most recent available data were used in both the 1995 RIA at Proposal and in the 1999 *Assessment* of the Final Rule. In the analysis of the Final Rule, we used the 1995 BRS for hazardous waste quantity estimates, and 1997 pricing information from industry representatives (adjusted to reflect 1996 dollars). We also revised energy data using the Portland Cement Association's "U.S. Cement Industry Fact Sheet" (1996), the Energy Information Administration's "Natural Gas Monthly" (March 1997), and, the "Annual Energy Review" (1996).

Waste Minimization Analysis

Revise the waste minimization analysis by improving the cost analysis of waste minimization alternatives. The panel suggested that fully-loaded cost-per-ton estimates should be provided for each waste minimization alternative so that these could be compared with combustion prices.

> For the 1999 *Assessment*, we conducted an expanded and significantly improved analysis of waste minimization alternatives. This analysis used a more detailed decision framework for evaluating waste minimization investment decisions that captures the full inventory of costs, savings and revenues, including indirect, less tangible items typically omitted from waste minimization analysis, such as liability and corporate image. For each waste minimization alternative that was identified as a viable alternative for currently combusted waste streams, cost curves were developed for a range of waste quantities (because cost varies by waste quantity). These cost curves were then used to determine whether a waste generator would shift from combustion to waste minimization alternatives as combustion prices rise. This detailed analysis is presented in an Appendix to the 1999 *Assessment.* Results from the analysis are also used to inform the elasticity of demand for combustion services (discussed in Chapter 5 of the *Assessment*).

DETAILED RESPONSES TO COMMENTS

General Comments

Aims, Objectives, and Organizing Principles for the RIA

G1) The RIA provides no rationale for the order or selection of information provided. In addition, a statement of organizing principle for the presentation and interpretation of information on costs and benefits should be provided.

We attempted to make the structure of the 1995 RIA clear through an explanation of the purpose of the RIA in the Executive Summary,[2] and an outline of the RIA along with concise descriptions of each chapter on page 1-6. Our thinking with respect to the order of the chapters was that the reader first needs an overview of the combustion market and practices (Chapter 2) in order to interpret the detailed assessments that follow. We then provide the engineering cost analysis in Chapter 3, which needs to be explained before costs are assessed in the context of the broader combustion market, allowing for competitive dynamics and market exit (Chapter 4). Next, the

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[2] "The RIA assesses the costs of the rule and the impacts that these costs would have on waste burning behavior, and compares these costs to the benefits of the regulation. ...[T]he RIA also provides the Agency with important information on how the proposed rule might affect the competitive dynamics in combustion markets." (RIA, ES-1)

benefits analysis is presented in Chapter 5. Finally, in Chapters 6 and 7, we evaluate impacts on small businesses and on minority and low income populations. We felt that these final analyses would be best understood after the cost and benefit presentation.

In the 1999 *Assessment*, we restructured the document so that it is more in line with OMB's 1996 Guidance for conducting Economic Analysis of Federal Regulations Under Executive Order 12866. The 1999 *Assessment* includes the following elements in the first chapter, which address concerns of the reviewers: the objectives of the Economic Assessment, the analytical requirements the document fulfills, the rationale for regulatory action, an examination of alternative regulatory options, the anticipated effect of the MACT standards, and our analytic approach and organization for the subsequent chapters.

Social Costs versus Compliance Costs

G2.1) The 1995 RIA does not incorporate the welfare economics aspects of this rule because it reported compliance costs rather than true social cost. Full social costs would include government administrative costs, as well as losses in consumers' or producers' surplus.

Estimating full social costs for this rule was difficult because there were inadequate data to conduct an econometric analysis. The econometric approach, by estimating supply and demand curves, provides an effective way to calculate the changes in producer and consumer surplus that are important components of full social costs. Even if high quality data were available, however, changes in hazardous waste markets over the last several years make it difficult to predict industry behavior on the basis of the historical price and output data utilized in an econometric analysis. Moreover, potential cost increases implied for some sectors may go beyond the marginal changes most readily analyzed by the econometric approach. For these reasons, we used estimates of compliance costs without market adjustments to provide an upper bound on social costs. The underlying assumption of this simplified approach is that economic welfare changes only include consumer surplus losses because we assume that all combustion facilities continue to operate at current production levels and pass through all (100 percent) of the cost increases associated with regulatory compliance.[3] Producer surplus losses are zero because there are no changes in output and revenue increases exactly offset cost increases associated with compliance. While social costs should also include government administrative costs, these costs are insignificant compared to the total private compliance costs of the rule. (For the final rule, we found that government administrative costs represent less than 1 percent of total compliance costs.)

[3] Compliance costs also include costs of disrupted production due to pollution control equipment installation (see page 3-7 of the 1995 RIA and page 4-10 of the 1999 *Assessment).*

While the social cost analysis uses compliance costs to provide an upper bound on social costs, more realistic compliance cost estimates should take into account market responses to the rule. More realistic national compliance cost estimates are presented in Chapter 5, where combustion units are allowed to exit the market and increase their prices for combustion. In this chapter, we also analyze other economic impact measures, described more fully under comment *4.1, Economic Impact Analysis*.

In both the 1995 RIA for the proposed rule, and the 1999 *Assessment* conducted in support of the final rule, we assessed impacts to consumers by calculating price increases expected to result from the rule. Since the elasticities of supply and demand were not known, price increases were bounded using three price pass-through scenarios for the 1995 analysis, (page 4-33 of the RIA) and four price increase scenarios for the 1999 analysis (pages 5-10 through 5-12 of the *Assessment*). The maximum loss in consumer surplus would occur under the high price pass-through scenario, where the entire median compliance cost in the lowest cost sector could be passed through to generators. Impacts to producers are assessed by estimating changes in operating profits and expected market exits. Maximum impacts in these areas would occur under the zero percent price pass-through.

In the 1999 *Assessment*, we clarified the difference between compliance costs and social costs, and explained how the rule will likely affect producers and consumers. We explicitly lay out the economic framework for the social cost analysis in Chapter 5, "Social Cost and Economic Impact Analysis," in the section titled "Social Cost Methodological Framework." Social costs are presented distinct from compliance cost estimates, which we include in Chapter 4 "Compliance Cost Analysis." Due to the same data limitations and market activity described above, we continue to use a simplified analytic framework rather than an econometric analysis to estimate social costs.

G2.2) The Panel also believes that general equilibrium and dynamic aspects of the rule should be considered.

General equilibrium analysis, in theory, should be able to provide estimates of the broader economic consequences of an environmental regulation, including the impacts of reallocating investment dollars and the interactions between sectors in the economy.

While a rigorous general equilibrium analysis was not conducted, the 1995 RIA recognizes that combustion prices may increase as a result of the MACT standards, thereby impacting other industry sectors (generators and fuel blenders). The RIA evaluates three combustion price scenarios -- zero, 25, and 100 percent of compliance costs[4] — to bound the impacts of the rule.[5] Under the high price pass-through scenario, we assume that all of the new compliance costs for the lowest-cost sector (cement kilns) could be shifted to generators in the form of higher combustion prices.[6] This

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[4] Median compliance cost per ton for combustion units in the lowest cost sector.

[5] High-end estimates of facility market exits are provided using the zero percent assumption.

[6] Under the high pass-through assumption, for example, the weighted average price increase ranges from $66 to $87 per ton, depending on the proposed MACT option. (RIA, 4-52). The lowest cost sector refers to the lowest total costs (baseline plus compliance costs) identified at the time of

assumption provides us with high-end estimates of total compliance costs as well as secondary impacts in the form of higher prices to generators and fuel blenders.

We use the same approach in the 1999 *Assessment* as applied in the 1995 RIA for the same reasons described above. We also conducted a detailed analysis of waste management alternatives to better inform the expected price pass-through. The results from the alternatives study suggested that demand is relatively inelastic and an average price pass-through of 75 percent was more appropriate for hazardous waste combustion. Thus, we also estimate social costs and economic impacts using the 75 percent price pass-though assumption.

Benefits Analysis

G3.1) Overall, the discussion and analysis of benefits of the rule was weak and not responsive to the requirements of the Executive Order. The peer reviewers also explained that we need to quantify and monetize where possible and describe other benefits qualitatively in more detail.

We agree that the benefits of the rule need to be evaluated and presented more thoroughly. Following review of comments on the benefits analysis, we prepared an overview of options to guide improvements for the final RIA.[7]

In the 1999 *Assessment,* we use results from an extensive multi-pathway risk assessment to develop human health and ecological benefit estimates. We do not include property value benefits due to limitations of the benefits transfer approach and because property value benefits likely overlap with human health and ecological benefits (including property value benefits would likely result in double-counting).[8] For the human health analysis, we estimate benefits from cancer and non-cancer risk reductions. We monetize cancer risk reduction estimates by applying the value of a statistical life (VSL) to the risk reduction expected to result from the MACT standards. The VSL is based on an individual's willingness to accept (WTA) increases in mortality risk.[9] Because there are many

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Proposal.

7 Alice Yates, Doug Koplow, and Tom Walker, "Memorandum: Overview of Available Options to Refine the Benefits Analysis," prepared by Industrial Economics for Gary Ballard, Office of Solid Waste, U.S. EPA, June 19, 1996.

8 Benefit estimates from hedonic property value studies generally reflect a variety of factors, including reductions in aesthetic nuisances and reductions in human health and ecological risks to surrounding areas.

9 We use the VSL approach for the final MACT benefits assessment instead of applying estimates of the Value of a Statistical Life Year (which values the number of life years lost as the result of premature mortality) because, while we have age stratified cancer incidence data for the local

different estimates of VSL in the economic literature, we estimate the reduced mortality benefits using a range of VSL estimates from 26 policy-relevant value-of-life studies.

We assign monetary values to non-cancer benefits using a direct-cost approach which focuses on the expenditures averted by decreasing the occurrence of an illness or other health effect. While the WTP (WTA) approach used for valuing the cancer risk reductions is conceptually superior to the direct cost approach, measurement difficulties, such as estimating the severity of various illnesses precludes us from using this approach here. Direct cost measures are expected to understate true benefits because they do not include cost of pain, suffering, and time lost.

The expanded 1999 benefits analysis also describes individual health risk reductions for subsistence farmers and fishermen. Because we do not have population data for the most sensitive sub-populations, we can only describe individual risk results and cannot make statements concerning the total number of people that may experience health benefits associated with the MACT standards. (nor is it appropriate to monetize these benefits).

G3.2) Cost-effectiveness is not a benefit/cost measure since there is no quantification of benefits.

In the 1995 RIA, the cost-effectiveness analysis is not presented as an attempt to quantify benefits. Throughout the section, the term "cost-effectiveness measure" is used rather than "benefit measure." In addition, the title of the chapter, "Cost-Effectiveness and Benefits Analysis," also indicates that the cost-effectiveness analysis is separate from the benefits analysis. The cost-effectiveness measure is a useful tool for EPA policy makers. This measure can be used to identify emissions that are most expensive to control. In addition, expenditures per ton of emissions reduction across various regulatory options can be compared to help select the most suitable option.

G3.3) Ecological risk benefits are not evaluated.

We agree that the ecological benefit analysis needs to be improved and we include an ecological benefits analysis in the 1999 *Assessment.* In this analysis, we calculate land and water areas that may experience reductions in ecological risk criteria below levels of concern. Reductions of dioxin, mercury, and lead were found to provide some potential for improvement of terrestrial and aquatic ecosystems. In the *Assessment,* we do not assign monetary values to these potential ecological benefits because no clear link exists between an exceedance in the ecological risk criteria and a real benefit measure, such as increased fish populations, for which a benefits transfer approach could assign monetary values.

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populations near incinerators, we do not have such data for cancer incidence from nationwide consumption of dioxin-contaminated foods.

CHAPTER-BY-CHAPTER COMMENTS

Review of Executive Summary

Requirements of Executive Order 12866

ES1) The Panel wants EPA to stipulate how we understand our RIA to meet the requirements of Executive Order 12866.

The main criticism with the 1995 RIA, in respect to not meeting the requirements of Executive Order 12866, was the weak benefits analysis. Improvements have been made to this analysis. (See response to *G3.1 Benefits Comments*.) The final 1999 *Assessment* also places the cost analysis within the broader context of social costs. (See response to *G.2.1 Social Costs versus Compliance Costs*.)

Review of Chapter 2

Section 2.1.1 Regulatory Requirements Encouraging Combustion

2.1) Second-order impacts on Superfund site clean-up may be possible (cost and timeliness of cleanup; added risks associated with removal and transportation) and should be considered.

Remediation waste accounts for about 15 percent of commercial incineration volumes and only about 3 percent of hazardous wastes that are incinerated or sent to commercial BIFs. In addition, combustion prices for contaminated soils and other solids have fallen substantially over the 1990s, suggesting that moderate price increases due to the rule will not cause major changes in historical cost levels. Finally, treatment of contaminated soils by incineration only accounts for a small percentage of total Superfund remediation costs.[10] We therefore expect the impacts of the rule on Superfund site cleanup to be minimal.

[10] In an examination of 229 Records of Decision (RODs), only 18 percent of the remedial treatments were categorized as "high intensity treatment." This category includes soil/sediment removal, ash disposal, site restoration, and onsite and offsite incineration. (Russell, Colglazier, and English, Hazardous Waste Remediation: The Task Ahead, The University of Tennessee, December 1991, page A-3.11.) In addition, direct response costs (site study and cleanup activities) account for less than half of total Superfund costs. (Probst, Fullerton, Litan, and Portney, "Footing the Bill for Superfund Cleanups: Who Pays and How?," The Brookings Institution and Resources for the Future, Washington, D.C.: 1995, page 23.)

Section 2.6.2.1 Existing Market Advantages for BIFs: Structural Advantages

2.2) BIFs and commercial incinerators may handle different wastes and therefore their costs and prices should also be different.

Instead of using different combustion prices for kilns and incinerators, the pricing approach used in the 1999 *Assessment* assigns different prices to different types of wastes. Waste management prices depend on several factors. These include the waste form (solid/liquid/sludge), heat content, method of delivery (e.g., bulk versus drum), and contamination level (e.g., metals or chlorine content). In addition, regulatory constraints (e.g., prohibitions against burning certain types of wastes) and technical constraints (e.g., adverse effects of certain waste streams on cement product quality) also influence combustion prices. Although data limitations prevent us from accounting for all factors, the information on heat content and constituent concentrations from EPA's National Hazardous Waste Constituent Survey (NHWCS)[11] allows us to enhance the characterization of combusted waste. Our data analysis of the NHWCS, combined with discussions with industry representatives, resulted in seven categories of waste types to which we assigned prices. The seven waste types are: comparable fuels (those wastes that meet the comparable fuel specifications);[12] liquids with suspended solids (these liquids contain some suspended solids; hazardous waste in this category exhibit high heating value and low-contaminant levels); high-contaminant liquids; less contaminated sludges; more highly contaminated sludges; less contaminated solids; and more highly contaminated solids.

2.3) The reviewers were concerned that the cement kiln sector had been mischaracterized as the "price leader" because prices should equilibrate across the sectors after announcements by the leaders, yet price differentials remain.

For certain types of waste streams (high BTU content, low metals and chlorine content), cement kilns are the lowest cost sector and thus might be characterized as price leaders in this context. However, we explain in the *Assessment* that some waste streams that are handled by commercial incinerators cannot be handled by cement kilns. For this reason, average prices would

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[11] The NHWCS was a voluntary survey that EPA distributed to the largest hazardous waste combustion treatment, storage and disposal facilities included in EPA's 1993 Biennial Reporting Survey (BRS). Prior to distribution, EPA pre-loaded the survey with 1993 BRS data. EPA asked recipients to verify the existing data and to provide additional data that might clarify the characteristics of the waste streams handled at specific facilities. EPA received responses for 147 of the 221 facilities to which the survey was sent.

[12] The comparable fuel exclusion is a conditional exclusion from RCRA for hazardous wastes that are similar in physical form and chemical makeup to fossil fuels. This exclusion is part of the "fast track" revised standards for hazardous waste combustion facilities.

not be expected to equilibrate across sectors for all waste streams, only for individual types of wastes.[13]

2.4) The RIA should include cost of fuel blending to get a true picture of baseline costs.

- We do not include the costs of fuel blending in the baseline because the tipping fees (and revenue estimates) reflect the price paid to combustion facilities and not to blenders. Kilns receive lower revenues from blenders for a ton of waste than they would if they took wastes directly from generators. This difference is reflected in the combustion prices; less-contaminated wastes (which tend to be handled through fuel blenders) command lower combustion prices.

- Blending costs for commercial incinerators tend to be much less than blending costs for wastes sent to cement kilns.

- Including fuel blending costs for cement kilns as well might narrow the baseline cost difference between BIFs and commercial incinerators. However, this inclusion is relatively insignificant compared to the benefits of sharing capital (i.e., the kiln) for cement production and hazardous waste destruction. In comparison, the baseline cost analysis included in the RIA suggests that fixed costs per ton of waste burned in cement kilns can be as low as 10 percent the fixed costs per ton at commercial incinerators due to the joint use of the kiln.

- While fuel blending may be vertically integrated into combustion operations, particularly at cement kilns, the tipping fees would reflect the internal transfer price. Incorporating the cost of blending without adjusting the fee for these services would result in inaccurate profit margins.

2.5) The RIA analyzes hazardous waste combustion at cement kilns and LWAKs in isolation from their primary line of business (cement or lightweight aggregate production).

The peer review panel is correct to point out that cement kilns will seek to maximize profits for the joint enterprises of cement production and hazardous waste destruction in order to maximize firm-level returns. As such, high returns on hazardous waste combustion may off-set inadequate returns on cement production. The MACT rule, which may reduce the returns to waste combustion

[13] In addition to different waste streams being managed by different combustion sectors, price differentials may be caused by a variety of other factors, such as distances from generators to BIFs versus cement kilns.

in kilns, may change this tradeoff. This type of cross-subsidization may occur during short-term downturns in the cement (and construction) market.

Over the long-run, however, kilns will eventually need to have both efficient cement production and efficient hazardous waste operations in order to survive in both markets. For this reason, results contained in EPA's 1995 RIA and 1999 *Assessment* of the MACT standards assume that there were no cross-subsidies between cement production and hazardous waste incineration. This assumption is also supported in a recent Cement Kiln Recycling Coalition (CKRC) analysis, which asserts that the hazardous waste incineration portion of cement kilns does not subsidize the cement manufacturing operations.[14] We also hypothesized in both the 1995 and 1999 analyses that cost increases associated with the MACT standards could not be passed through to consumers of cement due to the commodity nature of the product and the relatively low percentage of total cement kilns that burn hazardous materials.

Review of Chapter 3

Section 3.1.2.1 Total Costs Assuming No Market Exit

3.1) The Panel does not agree that compliance costs assuming no market exit represent an upper bound because they do not include other social welfare costs of the rule.

We recognize that, as the peer review panel stated, compliance costs alone do not incorporate all of the costs associated with the proposed rule. However, compliance cost estimates represent an upper bound on changes in consumer and producer surplus, if several simplifying assumptions are made, including that all units comply with the rule and that combustion units cannot exit the market. The reviewers accurately point out that this assumption is unrealistic because some of the combustion facilities will surely exit, a refinement we incorporate in Chapter 4 of the 1995 RIA. More discussion on the issue of social costs versus compliance costs is outlined in our response to *G2.1, Social Costs versus Compliance Costs* (above).

In the 1999 *Assessment*, we explicitly lay out the economic framework for the social cost analysis in Chapter 5, "Social Cost and Economic Impact Analysis," in the section titled "Social Cost Methodological Framework." Social costs are presented distinct from compliance cost estimates, which we include in Chapter 4 "Compliance Cost Analysis." Due to the same data limitations and market activity described above (in our response to *G2.1*), we continue to use a simplified analytic

[14] "Some critics have complained that the regulatory authorization for cement kilns to recycle hazardous waste fuels represents a subsidy to small, old, inefficient cement plants. This is clearly not true. . . . Most of the hazardous waste-burning kilns would remain economically viable even if they stopped using hazardous waste fuels." An Analysis of Technical Issues Pertaining to the Determination of MACT Standards for the Waste Recycling Segment of the Cement Industry, prepared by Environmental Risk Sciences, Inc., prepared for the Cement Kiln Recycling Coalition, May 1995, page IX-32.

framework rather than an econometric analysis to estimate social costs.

Review of Chapter 4

4.1) Explain what is meant by the term "Economic Impact Analysis" and how the approach used in the RIA follows OMB guidance.

The 1999 *Assessment* clearly explains what is meant by the term "Economic Impact Analysis" and how this differs from the social cost analysis. (See the introduction section of Chapter 5.) We describe the various economic impact measures that we analyzed and explain that these measures are distinct from the social cost estimates in that they provide insights into the distributional effects of the rule, impacts that may not represent net costs to society.

4.2) The actual costs of the rule are influenced by the unregulated community as well as the regulated community. The Panel argues that the RIA has a different concept of cost than does OMB.

The statement in the RIA that "actual costs will depend upon the incentives and reactions of the regulated community" refers to actual compliance costs. We also understand that compliance costs will depend upon the reactions of those that are "unregulated," such as generators of hazardous wastes that use incineration to manage their wastes. The reactions of these generators, however, will ultimately effect the extent to which combustion facilities can increase prices in the face of the rule. The 1995 RIA provides three price pass-through scenarios to bound the impacts of the rule, allowing for different reactions of the regulated, as well as "unregulated" community.

The 1999 *Assessment* clarifies the distinction between the regulated and the "unregulated" community in Chapter 5, "Social Cost and Economic Impact Analysis." We also link this to the economic methodological framework to show how the reactions of the unregulated community affect social costs (e.g., as demand becomes more elastic, total welfare losses approximate total compliance costs without market adjustments).

Section 4.1 Methodology

4.3) Profit maximization occurs at the firm level, not the unit level; therefore, the assumption that subsidies violate profit-maximization may be incorrect. This issue is discussed in relation to the assumptions used to consolidate waste flows at combustion facilities with multiple units by shutting one or more of the units down in order to enable the remaining units to meet their BEQ.

We do not take issue with the peer reviewers general statement that a firm will seek to maximize profits at the company level rather than at each specific plant or industrial process. However, cost accounting is generally an important component of such a firm-level calculation, to determine what businesses and product lines are profitable and which are not.

- It is generally recognized that profit maximization at a facility occurs by allocating production to the lowest cost systems first. The 1995 RIA and the 1999 *Assessment* apply this assumption in their cost analyses. There may be cases where fixed costs in the short-term (e.g., labor contracts) alter the short-term economics so that capital costs are not driving the decisions, or where strategic issues such as plant location affect production decisions. However, in our case, with multiple units at the same site, this is not likely to be a problem.

- It is possible that on-site incinerators operate as cost centers, not profit centers. We address this by calculating the break-even quantity (BEQ) for on-site incinerators based on the avoided cost of shipping wastes off-site. However, even if the incineration unit is treated as a cost center, the plant managers will, if unit costs rise too high, consider outsourcing the service.

- Peer reviewers suggest that we survey industry on this issue. For the 1995 RIA we talked with representatives from some on-site incinerators. For the 1999 *Assessment*, we conducted a more detailed analysis of the economics of on-site incinerators and accordingly made adjustments to the baseline cost estimates.

Section 4.1.1.1 Facility-Specific Data and Other Key Inputs Used in the Economic Screens

4.4) The panel criticizes the use of old data for the analysis; more recent data should be used, or the old data should be scaled to more recent years if comprehensive data sets are not available.

We fully agree with the peer review panel that data on hazardous waste combustion should be as up-to-date as possible. This is especially important in a dynamic industry, such as hazardous waste incineration. Primary data limitations are related to availability, verifiableness, reliability, and consistency.

For the 1999 *Assessment*, we update the data inputs to reflect the most recently available and verifiable National information. We used the 1995 BRS for hazardous waste quantity estimates, and pricing information from industry representatives in 1997 (adjusted to reflect 1996 dollars). We also revised energy data using the Portland Cement Association's "U.S. Cement Industry Fact Sheet" (1996), the Energy Information Administration's "Natural Gas Monthly" (March 1997) and the "Annual Energy Review" (1996).

Section 4.1.1.2 Baseline Cost Analysis

4.5) The pre-tax internal rate of return (IRR) seems the more appropriate choice of capitalization factor instead of the 10 percent annualization factor used in the analysis.

For the 1995 RIA; two main reasons accounted for our decision not to use the IRR as the capitalization factor:

- Baseline costs are based on a model-plant approach. Therefore, a single model applies to multiple firms, each of which is likely to have a different IRR.

- Data on the IRR are not generally available for combustion operations, since these are usually a small portion of a larger firm. Using a company-wide measure, especially if the firm is widely diversified, is likely to introduce more errors that it would correct for.

For the 1999 *Assessment,* baseline costs are annualized using a 7 percent discount rate, as recommended in the 1996 OMB Guidance for conducting economic assessments.[15] We calculate baseline costs in this way because data on the IRR are not generally available for combustion operations, since these are usually a small portion of a larger firm. We continue to believe that using a company-wide measure, especially if the firm is widely diversified, is likely to introduce more errors than it would correct for.

Section 4.1.3 Method for Analyzing the Impact of Waste Minimization

4.6) The waste minimization analysis is likely to overstate rates of adoption of alternatives. The analysis would be enhanced if better data on generation, distribution, and cost per ton were available.

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[15] The 7 percent rate is known as the "Circular A-94" rate, which was issued in 1992 after extensive public comment. It reflects the rates of return on low yielding forms of capital, such as housing, as well as the higher rates of returns yielded by corporate capital. (Office of Management and Budget, Circular No. A-94 Revised. "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs." October 29, 1992.) The number of years over which we annualize capital costs are specified in: "Revised Estimation of Baseline Costs for Hazardous Waste Combustors for Final MACT Rule," Prepared by Energy and Environmental Research Corporation, Prepared for Industrial Economics, Incorporated and U.S. Environmental Protection Agency, Office of Solid Waste Management Division," August 20, 1998, page 15.

We agree that better data and analysis would be useful. For the 1999 *Assessment*, we conducted an expanded and significantly improved analysis of waste minimization alternatives. This analysis used a more detailed decision framework for evaluating waste minimization investment decisions that captures the full inventory of costs, savings and revenues, including indirect, less tangible items typically omitted from waste minimization analysis, such as liability and corporate image. For each waste minimization alternative that was identified as a viable alternative for currently combusted waste streams, cost curves were developed for a range of waste quantities (because cost varies by waste quantity). These cost curves were then used to determine whether a waste generator would shift from combustion to waste minimization alternatives as combustion prices rise. The detailed analysis is presented in Appendix F of the 1999 *Assessment.* Results from the analysis are also used to inform the elasticity of demand for combustion services (discussed in Chapter 5 of the *Assessment*).

Section 4.1.5 Breakeven (BEQ) Analysis

4.7) Fixed annual capital costs should include both capital recovery and a reasonable return on capital; the appendices do not specify whether this is the case.

For both the 1995 RIA and the 1999 *Assessment*, we used the capital recovery factor to account for both the capital recovery and a reasonable return on capital. For the 1995 RIA, annual capital costs assume a 10 percent real rate of return. For the 1998 analysis, we used a 7 percent rate, consistent with OMB Guidance.

4.8) Capping the price pass-through at 25 percent is too restrictive. The peer reviewers suggest using anecdotal evidence on prices and capacity of alternative waste minimization options to get a more realistic value.

For the 1999 *Assessment*, we significantly improved our analysis of the elasticities of demand, using a more thorough and expanded waste minimization analysis (see response to *4.6* above). This analysis finds that the elasticity of demand varies with the starting point of combustion prices. (See Chapter 5 for a more detailed discussion in the "Combustion Price Increases" section.) Due to the variance of price elasticity across different waste types, we conducted a sensitivity analysis by evaluating the impact of the rule under four different price increase assumptions:

1. Combustion prices are completely elastic (i.e., combustion prices do not change).

2. Combustion prices are somewhat elastic.

3. Combustion prices are relatively inelastic.

4. Combustion prices are completely inelastic (i.e., this represents the maximum price increase).

4.9) Consolidation of waste streams makes sense, but this assumes inefficient operation in the baseline. The RIA should discuss why consolidation has not occurred in the baseline.

Poor data on the characteristics and quantities of waste burned present the biggest difficulty in understanding why consolidation has not occurred in the baseline. We conducted the consolidation routine in the baseline and found that only two systems consolidate in the short-term, and eight systems over the longer-term capital replacement cycle. In the 1999 *Assessment,* waste reallocation results are presented both in aggregate, and incremental to this baseline consolidation routine.

Section 4.1.5.2.1 Revenue and Pricing Increases

4.10) Ignoring revenues and costs of production of the primary products at cement kilns and LWAKs may result in understating the closures of these facilities since it is possible that the standards may make the operation as a whole unprofitable.

- See response to comment 4.3, under Section 4.1 Methodology.

Section 4.2.3.1.4 Operating Profits

4.11) While it is reasonable to evaluate the financial burden the MACT standards might place on hazardous waste burners by estimating changes in operating profits, changes in return on investment (ROI) might be a better measure.

- Due to the joint production issue involved with evaluating the cement kiln and LWAK sectors, the return-on-investment measure may prove to be more problematic than the more straightforward change in operating profits. The widespread use of on-site incinerators as a mechanism to reduce exposure to CERCLA liability would also complicate drawing conclusions from the ROI. While an ROI measure could be used for the commercial incinerator sector, it is not a useful indicator if it can't be compared across sectors.

Section 4.2.4 Total Costs of the Proposed MACT Standards

4.12) The total cost estimates in this section are compliance costs, and not the social costs of the regulations as specified by the OMB guidance. Since compliance costs have no welfare theoretic underpinnings, they cannot be meaningfully compared to benefits.

- Same response as to General Comments on "Social Costs versus Compliance Costs" above in comment G2.1.

Review of Chapter 5

Section 5.2 Health Benefits

5.1) See General Comments on Benefits, G3.1.

Section 5.3 Ecological Risks: Methodology and Results

5.2) Ecological benefits contained in the risk assessment are simply re-presented in the RIA, rather than being discussed, analyzed, and quantified.

We agree that stand-alone risk results are not very useful in a benefit-cost analysis to inform policy decisions. In the final *Assessment*, the ecological risk results are discussed and analyzed. However, ecological benefits are based on a screening analysis for ecological risks that compares soil, surface water, and sediment concentrations with eco-toxicological criteria based on *de minimis* thresholds for ecological effects. An exceedance of the eco-toxicological criteria only indicates the potential for adverse ecological effects, and does not necessarily indicate ecological damages. For this reason, we describe benefits of avoiding adverse ecological impacts qualitatively. We also provide numeric estimates of the land and surface water area that may experience improved ecological health.

Section 5.4 Other Socio-Economic Benefits

5.3) The peer reviewers noted that all other benefit categories also use benefits transfer, not just the property value analysis. The reviewers wanted to be certain that the valuation studies relied upon similar objects and circumstances of choice, so that the transfer exercise would yield meaningful results.

In the 1999 *Assessment*, we explicitly state which studies are used and why they are chosen to reflect similar objects and circumstances of choice.

Section 5.4.1 Property Value Benefits

5.4) The analysis of property value benefits has several limitations, including: (1) the benefits transfer is based on a single study of a municipal waste incinerator, which is a bad proxy for a hazardous waste incinerator; (2) the benefits transfer does not accurately provide an economic value for reduction in the emissions of a set of specified air pollutants; and (3) average property value benefits were computed for a sample of ten sites, but there is no discussion regarding the representativeness of these locations.

Based on peer review comment, we did not include the property value analysis in the Final *Assessment* due to the limitations of the benefits transfer approach and because property value benefits likely overlap with human health and ecological benefits (which we significantly improved upon).

Section 5.4.2 Other Benefit Categories

5.10) Material damage, aesthetic damage, and recreational and commercial fishing impacts are not adequately evaluated in the RIA.

We agree that these other types of benefits could be evaluated in greater detail either qualitatively or quantitatively. However, after conducting a screening analysis of these benefits, we found they were all of relatively small magnitude or not supported by scientific evidence or economic research. Thus, we do not include them in the Final *Assessment.*

- In terms of material damage, quantitative screening analysis estimates total damages from baseline emissions of PM at about $31,000 for commercial and on-site incinerators. This analysis was based on cost estimates developed by Mathtech in Benefits Analysis of Alternative Secondary National Ambient Air Quality Standards for Sulfur Dioxide and Total Suspended Particulates, prepared for U.S. EPA, 1982. While the analysis could be updated to include soiling benefits at cement kilns and lightweight aggregate kilns, PM soiling benefits will likely remain minimal due to the relatively smaller number of cement and lightweight aggregate kilns.

- In terms of noise and odor benefits, it seems unlikely that major benefits would result from the rule.

  -- Odor problems are related more to the types of wastes burned and less directly associated with incremental reductions of specific pollutants.

  -- While noise reduction from decreased traffic is possible at facilities where waste burning is discontinued (due to less frequent waste shipments to these facilities), the waste will be diverted to other facilities, thus offsetting the noise reduction benefits.

  -- At commercial incinerators that stop burning, noise reductions are most probable. We could estimate benefits for such facilities if an appropriate study exists that values such noise reductions. The RIA presents an estimate of $2,700 per home in areas exposed to peak noise levels from airports. However, since closure of a combustion facility will lead to less significant noise reductions, a study that analyzes noise reductions from an industrial facility closure would be more correct to use for the benefits transfer. Given the relatively small magnitude of benefits for this category, we did not include it in the Final *Assessment*.

- In terms of commercial and recreational fishing impacts, the risk assessment indicates that only one water body has baseline emissions that translate into mercury levels that may pose human health risks for people who fish from the water body. Thus, the potential for commercial or recreational fishing benefits is limited.

Appendix

ECONOMICS PEER REVIEW PANEL: COMMENTS ON THE REGULATORY IMPACT ASSESSMENT (RIA) FOR PROPOSED HAZARDOUS WASTE COMBUSTION MACT STANDARDS

(July 9, 1996)

[Please refer to the Docket for access to a hard copy of this Appendix]